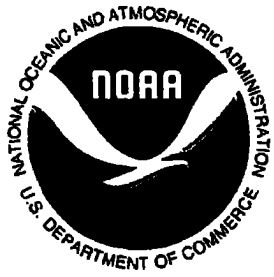
NOAA NESDIS
CENTRAL SATELLITE DATA PROCESSING CENTER



Advanced Microwave Sounding Unit-B (AMSU-B) Level 1b Format Specification for NOAA-N and the IJPS Era

Version 1.2

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1 Introduction

This document describes the AMSU-B Level 1b format, which is being updated for the IJPS era, beginning with NOAA-N. (NOTE: Even though there is no AMSU-B instrument on NOAA-N, nor on any IJPS satellite for that matter, its 1b format is being updated for consistency with the other instruments' formats, which are also being updated at this time.) This updated format will be applicable for all AMSU-B Level 1b data sets from the NOAA-KLM satellites beginning at or around the launch of NOAA-N.

Level 1b format specifications for the primary header record and the data record are provided in this document. Please note that as part of the updates to the Level 1b formats for NOAA-N and the IJPS era is the inclusion of additional, or secondary, header records. They will contain ancillary data set names and any metadata needed for, primarily, reprocessing. Currently, the content and format of any secondary header record is TBD. Applications that will access AMSU-B Level 1b data sets should use the "Count of Header Records in this Data Set" field, located in the first, or primary, header record, to calculate the position of the first data record and skip the secondary header records.

2 Applicable Documents

Table 1 presents a list of applicable documents (AD-#).

Doc #	Title	Reference Number	Issue	Date
AD-1	Unique Instrument Interface Specification for the AMSU-B	IS-2613442	Y	June 2000
AD-2	NOAA KLM User's Guide			Sept. 2000

Table 1 - Applicable Documents

3 Data Representation and Storage

This section describes the bit and byte numbering conventions used in this document, and the storage methods for integers and floating point numbers. This information is especially critical when transporting data from one computer architecture to another. Without special handling, data produced on one system may be unusable on another due to differences in internal data storage.

3.1 Bit Numbering

A byte in this document is defined as containing 8 bits. A word is 8, 16, or 32 bits in length. In all cases, the least significant bit (lsb) is designated as bit 0 and has a base-10 value of $2^0 = 1$. Therefore, in an 8-bit word the most significant bit (msb) is designated as bit 7, and has a base-10 value of $2^7 = 128$. In a 16-bit word the msb is designated as bit 15, and has a base-10 value of $2^{15} = 32{,}768$. In a 32-bit word the msb is designated as bit 31, and has a base-10 value of $2^{31} = 2{,}147{,}483{,}648$.

3.2 Signed Integers

For signed binary integers, the msb represents the sign of the number. The remaining bits (bits 6 through 0 for 8-bit words, 14 through 0 for 16-bit words, and 30 through 0 for 32-bit words) are used to designate the magnitude of the number. Therefore, the range of signed binary integers is based on word size as follows:

- 1 byte -128 to 127
- 2 bytes -32,768 to 32,767
- 4 bytes -2,147,483,648 to 2,147,483,647

Positive binary integers are in true binary notation with the sign bit set to zero. Negative binary integers are in two's-complement notation with the sign bit set to one. Negative binary integers are formed in two's-complement notation by inverting each bit of the positive binary integer and adding one.

3.3 Unsigned Integers

Unsigned binary integers use all bits including the msb to represent the magnitude of the number. Therefore, their range is as follows, again, based on word size:

- 1 byte 0 to 255
- 2 bytes 0 to 65,535
- 4 bytes 0 to 4,294,967,295

A field containing a binary integer is given the data type of unsigned integer if its content will never be negative or if a negative value just does not make sense for that field. For example, the idea of a negative scan line number or negative date or time is nonsensical. Therefore, fields containing scan line numbers, dates, and times are labeled as unsigned integers.

Unfortunately, this data type is not supported by all computer languages (e.g., Fortran), so additional data manipulation may be necessary. In the case of reading a 16-bit unsigned integer (DATA), a Fortran user could use the following code snippet to extract the actual value (VALUE):

```
...
INTEGER*2 DATA
INTEGER*4 VALUE
...
READ DATA
IF (DATA .LT. 0) THEN
     VALUE = 65536 + DATA
ELSE
     VALUE = DATA
ENDIF
...
```

But note that nearly all unsigned integer fields can be safely read into signed integer data types of the same word sizes. This is because they were originally written to the 1b using signed integer data types, and thus will be within the positive range of the corresponding signed integer

data type (see Section 3.2). The 1b format specifications will clearly indicate, by providing ranges, those unsigned integer fields that must be strictly treated as unsigned integer data types--using the data manipulation described above, if necessary--to ensure that correct values are retrieved.

However, not all fields of an unsigned integer data type contain unsigned binary integers. Fields containing *packed data* are also identified as unsigned integers. While its msb is not a sign bit, a field containing packed data does not represent an unsigned binary integer. Such a field requires the user to perform some type of special unpacking technique in order to extract the information of interest from the field in order for it to be interpreted correctly. Packed data may be bit fields, packed integers, or both. A bit field is one or more consecutive bits used to indicate one of two or more possible conditions or states. (A *bit flag* is a specialized instance of a bit field. It is a single bit indicating one of only two possible conditions.) For example, a three-bit field may indicate which of seven different modes that an instrument is operating in (i.e., 0 implies "power on mode", 1 implies "warm up mode", 2 implies "standby mode", etc.). A packed integer is simply a binary number that is stored in just a subset of an unsigned integer field's bits. Although similar to a bit field, a packed integer is not an indicator of a condition, but an actual numeric value having magnitude that, once unpacked, could be used in arithmetic computations.

3.4 Scaled Integers

To provide maximum portability of the Level 1b data sets across different computer platforms, floating point data is represented by scaled integers. Scaled integers can be either signed or unsigned, and are simply floating point numbers multiplied by a fixed scaling factor so that a sufficiently precise representation of the original number can be stored in integer form. For example, the floating point value 1.2313 might be multiplied by 10^2 to achieve an integer value of 123. To achieve better precision, the floating point value might be multiplied by 10^3 or 10^4 to achieve an integer value of 1231 or 12313, respectively. In the Level 1b data sets, the scaling factors are powers of ten, and only the exponents (2, 3, and 4 in the previous examples) are documented within the data set. To recover an approximation of the original floating point value, divide the integer value by ten raised to the given exponent.

3.5 Byte Ordering

A major problem impeding the free transport of binary data from one computer system to another is the "Big Endian - Little Endian" dichotomy. *Big Endian* systems (e.g. IBM 370, Macintosh, SGI, Sun SPARC) store bytes of binary numeric data in reverse order relative to *Little Endian* systems (e.g. IBM PC, DEC Alpha). For example, a 32-bit hexadecimal value of x01020304 (decimal value 16,909,060) written to a binary file by a Big Endian system would be read from the file as x04030201 (decimal value 67,305,985) by a Little Endian system. Level 1b data sets generated and archived by NOAA are in Big Endian order; users with Little Endian systems must include an additional byte-swapping step when reading binary numeric data from Level 1b data sets produced by NOAA. Some processors support byte swapping in their instruction sets, but others must use compiler-dependent functions.

4 AMSU-B Level 1b Format Specifications

The format specifications for the AMSU-B Level 1b header record and AMSU-B Level 1b data record are given in this section. The meaning of each column in the format specifications is defined in Table 2.

Name	Description
Field Name	The name or brief description of the field.
Start Octet	Offset location of first octet in the defined field from beginning of record, starting with octet 1. (Note that the terms "octet" and "byte" are used interchangeably and mean the same thing.)
End Octet	Offset location of last octet in the defined field from beginning of record.
Data Type	Data Type (i - integer, u - unsigned integer, c - character). Character data is stored as ASCII.
Word Size	Number of octets per data word.
Number of Words	Number of words of indicated size and type contained in the defined field.
Scale Factor	Scaling Factor.
Units	The field's unit of measurement (e.g., octets, counts, Kelvin, volts), if applicable.
Notes	References to notes that follow the format specifications in Section 6.

Table 2 - Description of Format Specification Columns

4.1 AMSU-B 1b Primary Header Record Format

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
FILE IDENTIFICATION								
Data Set Creation Site ID CMS=Centre de Meteorologie Spatiale/France DSS=Dundee Satellite Receiving Station/UK NSS=National Environmental Satellite, Data and Information Service/USA UKM=United Kingdom Meteorological Office/UK	1	3	c	3	1	0		
<ASCII blank = x20>	4	4	c	1	1	0		
Level 1b Format Version Number	5	6	u	2	1	0		
Level 1b Format Version Year *(four digits, e.g., 2000)*	7	8	u	2	1	0		
Level 1b Format Version Day of Year *(e.g., 365)*	9	10	u	2	1	0		
<Reserved for Logical Record Length> *(For Creation Site use only. Logical Record Length of source 1b data set prior to processing.)*	11	12	u	2	1	0	octets	
<Reserved for Block Size> *(For Creation Site use only. Block Size of source 1b data set prior to processing.)*	13	14	u	2	1	0	octets	
Count of Header Records in this Data Set	15	16	u	2	1	0		
<Zero Fill>	17	22	i	2	3	0		
Data Set Name	23	64	c	42	1	0		
Processing Block Identification	65	72	c	8	1	0		
NOAA Spacecraft Identification Code 2=NOAA-L 4=NOAA-K 6=NOAA-M	73	74	u	2	1	0		
Instrument ID 4=protoflight model (PFM) (NOAA-K) 8=FM 2 (NOAA-L) 12=FM 3 (NOAA-M)	75	76	u	2	1	0		
Data Type Code 11=AMSU-B	77	78	u	2	1	0		
TIP Source Code 0=unused, i.e., GAC/HRPT/LAC data 1=GAC-embedded AMSU and TIP 2=stored TIP (STIP) 3=HRPT/LAC-embedded AMSU and TIP 4=stored AIP (SAIP)	79	80	u	2	1	0		
Start of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	81	84	u	4	1	0		
Start of Data Set Year *(four digits, e.g., 2000)*	85	86	u	2	1	0		
Start of Data Set Day of Year *(e.g., 365)*	87	88	u	2	1	0		
Start of Data Set UTC Time of Day	89	92	u	4	1	0	milliseconds	
End of Data Set Day Count starting from 0 at 00h, 1 Jan 1950	93	96	u	4	1	0		
End of Data Set Year *(four digits, e.g., 2000)*	97	98	u	2	1	0		
End of Data Set Day of Year *(e.g., 365)*	99	100	u	2	1	0		
End of Data Set UTC Time of Day	101	104	u	4	1	0	milliseconds	
Year of Last CPIDS Update *(four digits, e.g., 2000)*	105	106	u	2	1	0		
Day of Year of Last CPIDS Update *(e.g., 365)*	107	108	u	2	1	0		
Offset between Start of Scan and Center of First FOV	109	110	i	2	1	0	milliseconds	
<Zero Fill>	111	120	i	2	5	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
DATA SET QUALITY INDICATORS								
Instrument Status bits 31-29: <not defined> bit 28: processor check flag (0=passed; 1=failed) bit 27: scan control status (0=running; 1=aborted) bit 26: pixel data invalid flag (0=valid; 1=invalid) bit 25: scan synchronization (0=error < 0.1 deg; 1=error >= 0.1 deg) bit 24: mode transition flag (0=transition complete; 1=transition in progress) bit 23: module ID, msb bits 22 - 17: module ID bit 16: module ID, lsb bit 15: RAM check flag (0=passed; 1=failed) bit 14: ROM check flag (0=passed; 1=failed) bit 13: memory checks status (0=disabled; 1=enabled) bit 12: space view select, lsb bit 11: space view select, msb bit 10: channel 18/19/20 (relay 5 status) (0=off; 1=on) bit 9: channel 17 (relay 4 status) (0=off; 1=on) bit 8: channel 16 (relay 3 status) (0=off; 1=on) bit 7: stepped mode (0=no; 1=yes) bit 6: investigation mode (0=no; 1=yes) bit 5: parked in space view mode (0=no; 1=yes) bit 4: parked in nadir view mode (0=no; 1=yes) bit 3: parked in target view mode (0=no; 1=yes) bit 2: scan normal mode (0=no; 1=yes) bit 1: survival heater (relay 2 status) (0=off; 1=on) bit 0: power (relay 1 status) (0=off; 1=on)	121	124	u	4	1	0		
<Zero Fill>	125	126	i	2	1	0		
Record Number of Status Change *(if 0, none occurred)*	127	128	u	2	1	0		
Second Instrument Status *(if previous word is 0, no change)*	129	132	u	4	1	0		
Count of Data Records in this Data Set	133	134	u	2	1	0		
Count of Calibrated, Earth Located Scan Lines in this Data Set	135	136	u	2	1	0		
Count of Missing Scan Lines	137	138	u	2	1	0		
Count of Data Gaps in this Data Set	139	140	u	2	1	0		
Count of Data Frames Without Frame Sync Word Errors	141	142	u	2	1	0		
Count of PACS Detected TIP Parity Errors	143	144	u	2	1	0		
Sum of All Auxiliary Sync Errors Detected in the Input Data	145	146	u	2	1	0		
Time Sequence Error 0=none; otherwise, the record number of the first occurrence	147	148	u	2	1	0		
Time Sequence Error Code *(These are bit flags taken from "Scan Line Quality Flags [Time Problem Code]" on data record reported in "Time Sequence Error" field above. If a bit is on (=1) then the statement is true.)* bits 15-8: <zero fill> bit 7: time field is bad but can probably be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 5: this record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity); may be associated with a spacecraft clock update bit 4: start of a sequence that apparently repeats scan times that have been previously accepted bits 3-0: <zero fill>	149	150	u	2	1	0		
SOCC Clock Update Indicator 0=none during this orbit; otherwise, the record number of the first occurrence	151	152	u	2	1	0		
Earth Location Error Indicator 0=none during this orbit; otherwise, the record number of the first occurrence	153	154	u	2	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Earth Location Error Code *(These are bit flags taken from Scan Line Quality Flags [Earth Location Problem Code]" on data record reported in "Earth Location Error Indicator" field above. If a bit is on (=1) then the statement is true.)* bits 15-8: <zero fill> bit 7: not earth located because of bad time; earth location fields zero-filled bit 6: earth location questionable: questionable time code bit 5: earth location questionable: marginal agreement with reasonableness check bit 4: earth location questionable: fails reasonableness check bit 3: earth location questionable because of antenna position check bits 2-0: <zero fill>	155	156	u	2	1	0		
PACS Status Bit Field bits 15-3: <zero fill> bit 2: pseudonoise (0=normal data; 1=pseudonoise data) bit 1: tape direction (0=reverse playback, time decrementing) bit 0: data mode (0=test data; 1=flight data)	157	158	u	2	1	0		
Data Source 0=unused 1=Fairbanks, AK 2=Wallops Is., VA 3=SOCC 4=Svalbard, Norway 5=Monterey, CA	159	160	u	2	1	0		
<Reserved for the Ingester>	161	168	c	8	1	0		
<Reserved for Decommutation>	169	176	c	8	1	0		
<Zero Fill>	177	192	i	4	4	0		
CALIBRATION								
Instrument Temperature Sensor ID 0=mixer temperature of channels 18-20 1=mixer temperature of channel 16	193	194	i	2	1	0		
<Zero Fill>	195	196	i	2	1	0		
Minimum Reference Temperature, mixer of Ch 18 - 20	197	198	i	2	1	2	K	
Nominal Reference Temperature, mixer of Ch 18 - 20	199	200	i	2	1	2	K	
Maximum Reference Temperature, mixer of Ch 18 - 20	201	202	i	2	1	2	K	
Minimum Reference Temperature, mixer of Ch 16	203	204	i	2	1	2	K	
Nominal Reference Temperature, mixer of Ch 16	205	206	i	2	1	2	K	
Maximum Reference Temperature, mixer of Ch 16	207	208	i	2	1	2	K	
Warm Target Fixed Bias Correction Ch 16 Min Temperature	209	210	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 16 Nominal Temperature	211	212	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 16 Max Temperature	213	214	i	2	1	3	K	
Space Fixed Bias Correction Ch 16	215	216	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 17 Min Temperature	217	218	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 17 Nominal Temperature	219	220	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 17 Max Temperature	221	222	i	2	1	3	K	
Space Fixed Bias Correction Ch 17	223	224	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 18 Min Temperature	225	226	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 18 Nominal Temperature	227	228	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 18 Max Temperature	229	230	i	2	1	3	K	
Space Fixed Bias Correction Ch 18	231	232	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 19 Min Temperature	233	234	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 19 Nominal Temperature	235	236	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 19 Max Temperature	237	238	i	2	1	3	K	
Space Fixed Bias Correction Ch 19	239	240	i	2	1	3	K	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Warm Target Fixed Bias Correction Ch 20 Min Temperature	241	242	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 20 Nominal Temperature	243	244	i	2	1	3	K	
Warm Target Fixed Bias Correction Ch 20 Max Temperature	245	246	i	2	1	3	K	
Space Fixed Bias Correction Ch 20	247	248	i	2	1	3	K	
Nonlinearity Coeff. Ch 1 at Reference Temperature 1	249	252	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 1 at Reference Temperature 2	253	256	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 1 at Reference Temperature 3	257	260	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 2 at Reference Temperature 1	261	264	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 2 at Reference Temperature 2	265	268	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 2 at Reference Temperature 3	269	272	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 3 at Reference Temperature 1	273	276	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 3 at Reference Temperature 2	277	280	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 3 at Reference Temperature 3	281	284	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 4 at Reference Temperature 1	285	288	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 4 at Reference Temperature 2	289	292	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 4 at Reference Temperature 3	293	296	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 5 at Reference Temperature 1	297	300	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 5 at Reference Temperature 2	301	304	i	4	1	3	m^2-sr-cm^{-1}/mW	
Nonlinearity Coeff. Ch 5 at Reference Temperature 3	305	308	i	4	1	3	m^2-sr-cm^{-1}/mW	
<Zero Fill>	309	324	i	4	4	0		
TEMPERATURE-RADIANCE CONVERSION								
Temperature-radiance Ch 16 Central Wavenumber	325	328	i	4	1	6	cm^{-1}	
Temperature-radiance Ch 16 Constant 1	329	332	i	4	1	6		
Temperature-radiance Ch 16 Constant 2	333	336	i	4	1	6		
Temperature-radiance Ch 17 Central Wavenumber	337	340	i	4	1	6	cm^{-1}	
Temperature-radiance Ch 17 Constant 1	341	344	i	4	1	6		
Temperature-radiance Ch 17 Constant 2	345	348	i	4	1	6		
Temperature-radiance Ch 18 Central Wavenumber	349	352	i	4	1	6	cm^{-1}	
Temperature-radiance Ch 18 Constant 1	353	356	i	4	1	6		
Temperature-radiance Ch 18 Constant 2	357	360	i	4	1	6		
Temperature-radiance Ch 19 Central Wavenumber	361	364	i	4	1	6	cm^{-1}	
Temperature-radiance Ch 19 Constant 1	365	368	i	4	1	6		
Temperature-radiance Ch 19 Constant 2	369	372	i	4	1	6		
Temperature-radiance Ch 20 Central Wavenumber	373	376	i	4	1	6	cm^{-1}	
Temperature-radiance Ch 20 Constant 1	377	380	i	4	1	6		
Temperature-radiance Ch 20 Constant 2	381	384	i	4	1	6		
<Zero Fill>	385	400	i	4	4	0		
NAVIGATION								
Reference Ellipsoid Model ID *(The ellipsoid is a mathematically tractable approximation of the geoid, which is an equipotential surface at mean sea level. The maximum departure of the ellipsoid from the geoid is approximately +/- 65 meters.)* WGS-72=World Geodetic Survey 1972	401	408	c	8	1	0		
Nadir Earth Location Tolerance	409	410	u	2	1	1	kilometers	
Earth Location Bit Field bits 15-3: <zero fill> bit 2: dynamic attitude error correction (0=not performed; 1=performed) bit 1: reasonableness test (0=inactive; 1=active) bit 0: constant attitude error correction (0=not performed; 1=performed)	411	412	u	2	1	0		
<Zero Fill>	413	414	i	2	1	0		
Constant Roll Attitude Error	415	416	i	2	1	3	degrees	
Constant Pitch Attitude Error	417	418	i	2	1	3	degrees	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Constant Yaw Attitude Error	419	420	i	2	1	3	degrees	
Epoch Year for Orbit Vector	421	422	u	2	1	0		
Day of Epoch Year for Orbit Vector	423	424	u	2	1	0		
Epoch UTC Time of Day for Orbit Vector	425	428	u	4	1	0	milliseconds	
Semi-major Axis *(at the orbit vector epoch time)*	429	432	i	4	1	5	kilometers	
Eccentricity *(at the orbit vector epoch time)*	433	436	i	4	1	8		
Inclination *(at the orbit vector epoch time)*	437	440	i	4	1	5	degrees	
Argument of Perigee *(at the orbit vector epoch time)*	441	444	i	4	1	5	degrees	
Right Ascension of the Ascending Node *(at the orbit vector epoch time)*	445	448	i	4	1	5	degrees	
Mean Anomaly *(at the orbit vector epoch time)*	449	452	i	4	1	5	degrees	
Position Vector X Component *(at the orbit vector epoch time)*	453	456	i	4	1	5	kilometers	
Position Vector Y Component *(at the orbit vector epoch time)*	457	460	i	4	1	5	kilometers	
Position Vector Z Component *(at the orbit vector epoch time)*	461	464	i	4	1	5	kilometers	
Velocity Vector X-dot Component *(at the orbit vector epoch time)*	465	468	i	4	1	8	km/second	
Velocity Vector Y-dot Component *(at the orbit vector epoch time)*	469	472	i	4	1	8	km/second	
Velocity Vector Z-dot Component *(at the orbit vector epoch time)*	473	476	i	4	1	8	km/second	
Earth/Sun Distance Ratio *(at the orbit vector epoch time; relative to the mean distance of 1 AU)*	477	480	u	4	1	6		
<Zero Fill>	481	496	i	4	4	0		
DIGITAL A TELEMETRY CONVERSION								
Mixer 16 Temperature Coefficient 0	497	498	i	2	1	2	K	
Mixer 16 Temperature Coefficient 1	499	500	i	2	1	7	K/count	
Mixer 16 Temperature Coefficient 2	501	502	i	2	1	12	$K/count^2$	
Mixer 16 Temperature Coefficient 3	503	504	i	2	1	18	$K/count^3$	
Mixer 17 Temperature Coefficient 0	505	506	i	2	1	2	K	
Mixer 17 Temperature Coefficient 1	507	508	i	2	1	7	K/count	
Mixer 17 Temperature Coefficient 2	509	510	i	2	1	12	$K/count^2$	
Mixer 17 Temperature Coefficient 3	511	512	i	2	1	18	$K/count^3$	
Mixer 18, 19, & 20 Temperature Coefficient 0	513	514	i	2	1	2	K	
Mixer 18, 19, & 20 Temperature Coefficient 1	515	516	i	2	1	7	K/count	
Mixer 18, 19, & 20 Temperature Coefficient 2	517	518	i	2	1	12	$K/count^2$	
Mixer 18, 19, & 20 Temperature Coefficient 3	519	520	i	2	1	18	$K/count^3$	
FET Amplifier 16 Temperature Coefficient 0	521	522	i	2	1	2	K	
FET Amplifier 16 Temperature Coefficient 1	523	524	i	2	1	7	K/count	
FET Amplifier 16 Temperature Coefficient 2	525	526	i	2	1	12	$K/count^2$	
FET Amplifier 16 Temperature Coefficient 3	527	528	i	2	1	18	$K/count^3$	
FET Amplifier 17 Temperature Coefficient 0	529	530	i	2	1	2	K	
FET Amplifier 17 Temperature Coefficient 1	531	532	i	2	1	7	K/count	
FET Amplifier 17 Temperature Coefficient 2	533	534	i	2	1	12	$K/count^2$	
FET Amplifier 17 Temperature Coefficient 3	535	536	i	2	1	18	$K/count^3$	
FET Amplifier 18 Temperature Coefficient 0	537	538	i	2	1	2	K	
FET Amplifier 18 Temperature Coefficient 1	539	540	i	2	1	7	K/count	
FET Amplifier 18 Temperature Coefficient 2	541	542	i	2	1	12	$K/count^2$	
FET Amplifier 18 Temperature Coefficient 3	543	544	i	2	1	18	$K/count^3$	
FET Amplifier 19 Temperature Coefficient 0	545	546	i	2	1	2	K	
FET Amplifier 19 Temperature Coefficient 1	547	548	i	2	1	7	K/count	
FET Amplifier 19 Temperature Coefficient 2	549	550	i	2	1	12	$K/count^2$	
FET Amplifier 19 Temperature Coefficient 3	551	552	i	2	1	18	$K/count^3$	
FET Amplifier 20 Temperature Coefficient 0	553	554	i	2	1	2	K	
FET Amplifier 20 Temperature Coefficient 1	555	556	i	2	1	7	K/count	
FET Amplifier 20 Temperature Coefficient 2	557	558	i	2	1	12	$K/count^2$	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
FET Amplifier 20 Temperature Coefficient 3	559	560	i	2	1	18	K/count^3	
Calibration Target Temperature 1 Coefficient 0	561	562	i	2	1	2	K	
Calibration Target Temperature 1 Coefficient 1	563	564	i	2	1	7	K/count	
Calibration Target Temperature 1 Coefficient 2	565	566	i	2	1	12	K/count^2	
Calibration Target Temperature 1 Coefficient 3	567	568	i	2	1	18	K/count^3	
Calibration Target Temperature 2 Coefficient 0	569	570	i	2	1	2	K	
Calibration Target Temperature 2 Coefficient 1	571	572	i	2	1	7	K/count	
Calibration Target Temperature 2 Coefficient 2	573	574	i	2	1	12	K/count^2	
Calibration Target Temperature 2 Coefficient 3	575	576	i	2	1	18	K/count^3	
Calibration Target Temperature 3 Coefficient 0	577	578	i	2	1	2	K	
Calibration Target Temperature 3 Coefficient 1	579	580	i	2	1	7	K/count	
Calibration Target Temperature 3 Coefficient 2	581	582	i	2	1	12	K/count^2	
Calibration Target Temperature 3 Coefficient 3	583	584	i	2	1	18	K/count^3	
Calibration Target Temperature 4 Coefficient 0	585	586	i	2	1	2	K	
Calibration Target Temperature 4 Coefficient 1	587	588	i	2	1	7	K/count	
Calibration Target Temperature 4 Coefficient 2	589	590	i	2	1	12	K/count^2	
Calibration Target Temperature 4 Coefficient 3	591	592	i	2	1	18	K/count^3	
Calibration Target Temperature 5 Coefficient 0	593	594	i	2	1	2	K	
Calibration Target Temperature 5 Coefficient 1	595	596	i	2	1	7	K/count	
Calibration Target Temperature 5 Coefficient 2	597	598	i	2	1	12	K/count^2	
Calibration Target Temperature 5 Coefficient 3	599	600	i	2	1	18	K/count^3	
Calibration Target Temperature 6 Coefficient 0	601	602	i	2	1	2	K	
Calibration Target Temperature 6 Coefficient 1	603	604	i	2	1	7	K/count	
Calibration Target Temperature 6 Coefficient 2	605	606	i	2	1	12	K/count^2	
Calibration Target Temperature 6 Coefficient 3	607	608	i	2	1	18	K/count^3	
Calibration Target Temperature 7 Coefficient 0	609	610	i	2	1	2	K	
Calibration Target Temperature 7 Coefficient 1	611	612	i	2	1	7	K/count	
Calibration Target Temperature 7 Coefficient 2	613	614	i	2	1	12	K/count^2	
Calibration Target Temperature 7 Coefficient 3	615	616	i	2	1	18	K/count^3	
Sub-reflector Temperature 1 Coefficient 0	617	618	i	2	1	2	K	
Sub-reflector Temperature 1 Coefficient 1	619	620	i	2	1	7	K/count	
Sub-reflector Temperature 1 Coefficient 2	621	622	i	2	1	12	K/count^2	
Sub-reflector Temperature 1 Coefficient 3	623	624	i	2	1	18	K/count^3	
LO Monitor Current Ch 16 Coefficient 0	625	626	i	2	1	3	mA	
LO Monitor Current Ch 16 Coefficient 1	627	628	i	2	1	5	mA/count	
LO Monitor Current Ch 16 Coefficient 2	629	630	i	2	1	0	mA/count^2	
LO Monitor Current Ch 16 Coefficient 3	631	632	i	2	1	0	mA/count^3	
LO Monitor Current Ch 17 Coefficient 0	633	634	i	2	1	3	mA	
LO Monitor Current Ch 17 Coefficient 1	635	636	i	2	1	5	mA/count	
LO Monitor Current Ch 17 Coefficient 2	637	638	i	2	1	0	mA/count^2	
LO Monitor Current Ch 17 Coefficient 3	639	640	i	2	1	0	mA/count^3	
LO Monitor Current Ch 18, 19, & 20 Coefficient 0	641	642	i	2	1	3	mA	
LO Monitor Current Ch 18, 19, & 20 Coefficient 1	643	644	i	2	1	5	mA/count	
LO Monitor Current Ch 18, 19, & 20 Coefficient 2	645	646	i	2	1	0	mA/count^2	
LO Monitor Current Ch 18, 19, & 20 Coefficient 3	647	648	i	2	1	0	mA/count^3	
LO Ch 16 Temperature Coefficient 0	649	650	i	2	1	2	K	
LO Ch 16 Temperature Coefficient 1	651	652	i	2	1	7	K/count	
LO Ch 16 Temperature Coefficient 2	653	654	i	2	1	12	K/count^2	
LO Ch 16 Temperature Coefficient 3	655	656	i	2	1	18	K/count^3	
LO Ch 17 Temperature Coefficient 0	657	658	i	2	1	2	K	
LO Ch 17 Temperature Coefficient 1	659	660	i	2	1	7	K/count	
LO Ch 17 Temperature Coefficient 2	661	662	i	2	1	12	K/count^2	
LO Ch 17 Temperature Coefficient 3	663	664	i	2	1	18	K/count^3	
LO Ch 18, 19, & 20 Temperature Coefficient 0	665	666	i	2	1	2	K	
LO Ch 18, 19, & 20 Temperature Coefficient 1	667	668	i	2	1	7	K/count	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
O Ch 18, 19, & 20 Temperature Coefficient 2	669	670	i	2	1	12	K/count^2	
O Ch 18, 19, & 20 Temperature Coefficient 3	671	672	i	2	1	18	K/count^3	
PRT Bridge Voltage Coefficient 0	673	674	i	2	1	0	V	
PRT Bridge Voltage Coefficient 1	675	676	i	2	1	5	V/count	
PRT Bridge Voltage Coefficient 2	677	678	i	2	1	0	V/count^2	
PRT Bridge Voltage Coefficient 3	679	680	i	2	1	0	V/count^3	
PRT Board Temperature Coefficient 0	681	682	i	2	1	1	K	
PRT Board Temperature Coefficient 1	683	684	i	2	1	6	K/count	
PRT Board Temperature Coefficient 2	685	686	i	2	1	10	K/count^2	
PRT Board Temperature Coefficient 3	687	688	i	2	1	15	K/count^3	
<Zero Fill>	689	704	i	4	4	0		
ANALOG TELEMETRY CONVERSION								
+12V (A) Secondary Conversion Coefficient 0	705	708	i	4	1	6	V	
+12V (A) Secondary Conversion Coefficient 1	709	712	i	4	1	6	V/count	
+12V (A) Secondary Conversion Coefficient 2	713	716	i	4	1	6	V/count^2	
+12V (A) Secondary Conversion Coefficient 3	717	720	i	4	1	6	V/count^3	
-12V (A) Secondary Conversion Coefficient 0	721	724	i	4	1	6	V	
-12V (A) Secondary Conversion Coefficient 1	725	728	i	4	1	6	V/count	
-12V (A) Secondary Conversion Coefficient 2	729	732	i	4	1	6	V/count^2	
-12V (A) Secondary Conversion Coefficient 3	733	736	i	4	1	6	V/count^3	
+15V (A) Secondary Conversion Coefficient 0	737	740	i	4	1	6	V	
+15V (A) Secondary Conversion Coefficient 1	741	744	i	4	1	6	V/count	
+15V (A) Secondary Conversion Coefficient 2	745	748	i	4	1	6	V/count^2	
+15V (A) Secondary Conversion Coefficient 3	749	752	i	4	1	6	V/count^3	
-15V (A) Secondary Conversion Coefficient 0	753	756	i	4	1	6	V	
-15V (A) Secondary Conversion Coefficient 1	757	760	i	4	1	6	V/count	
5V (A) Secondary Conversion Coefficient 2	761	764	i	4	1	6	V/count^2	
-15V (A) Secondary Conversion Coefficient 3	765	768	i	4	1	6	V/count^3	
+8v (A) Secondary Conversion Coefficient 0	769	772	i	4	1	6	V	
+8v (A) Secondary Conversion Coefficient 1	773	776	i	4	1	6	V/count	
+8v (A) Secondary Conversion Coefficient 2	777	780	i	4	1	6	V/count^2	
+8v (A) Secondary Conversion Coefficient 3	781	784	i	4	1	6	V/count^3	
+5V (D) Secondary Conversion Coefficient 0	785	788	i	4	1	6	V	
+5V (D) Secondary Conversion Coefficient 1	789	792	i	4	1	6	V/count	
+5V (D) Secondary Conversion Coefficient 2	793	796	i	4	1	6	V/count^2	
+5V (D) Secondary Conversion Coefficient 3	797	800	i	4	1	6	V/count^3	
+5V (A) Secondary Conversion Coefficient 0	801	804	i	4	1	6	V	
+5V (A) Secondary Conversion Coefficient 1	805	808	i	4	1	6	V/count	
+5V (A) Secondary Conversion Coefficient 2	809	812	i	4	1	6	V/count^2	
+5V (A) Secondary Conversion Coefficient 3	813	816	i	4	1	6	V/count^3	
-5V (A) Secondary Conversion Coefficient 0	817	820	i	4	1	6	V	
-5V (A) Secondary Conversion Coefficient 1	821	824	i	4	1	6	V/count	
-5V (A) Secondary Conversion Coefficient 2	825	828	i	4	1	6	V/count^2	
-5V (A) Secondary Conversion Coefficient 3	829	832	i	4	1	6	V/count^3	
+5V Reference Secondary Conv Coefficient 0	833	836	i	4	1	6	V	
+5V Reference Secondary Conv Coefficient 1	837	840	i	4	1	6	V/count	
+5V Reference Secondary Conv Coefficient 2	841	844	i	4	1	6	V/count^2	
+5V Reference Secondary Conv Coefficient 3	845	848	i	4	1	6	V/count^3	
ICE Temperature Conversion Coefficient 0	849	852	i	4	1	6	K	
ICE Temperature Conversion Coefficient 1	853	856	i	4	1	6	K/count	
ICE Temperature Conversion Coefficient 2	857	860	i	4	1	6	K/count^2	
CE Temperature Conversion Coefficient 3	861	864	i	4	1	6	K/count^3	
MDE Temperature Conversion Coefficient 0	865	868	i	4	1	6	K	
MDE Temperature Conversion Coefficient 1	869	872	i	4	1	6	K/count	
MDE Temperature Conversion Coefficient 2	873	876	i	4	1	6	K/count^2	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
MDE Temperature Conversion Coefficient 3	877	880	i	4	1	6	$K/count^3$	
PEU Temperature Conversion Coefficient 0	881	884	i	4	1	6	K	
PEU Temperature Conversion Coefficient 1	885	888	i	4	1	6	K/count	
PEU Temperature Conversion Coefficient 2	889	892	i	4	1	6	$K/count^2$	
PEU Temperature Conversion Coefficient 3	893	896	i	4	1	6	$K/count^3$	
PSU Temperature Conversion Coefficient 0	897	900	i	4	1	6	K	
PSU Temperature Conversion Coefficient 1	901	904	i	4	1	6	K/count	
PSU Temperature Conversion Coefficient 2	905	908	i	4	1	6	$K/count^2$	
PSU Temperature Conversion Coefficient 3	909	912	i	4	1	6	$K/count^3$	
Scan Motor Temperature Conv Coefficient 0	913	916	i	4	1	6	K	
Scan Motor Temperature Conv Coefficient 1	917	920	i	4	1	6	K/count	
Scan Motor Temperature Conv Coefficient 2	921	924	i	4	1	6	$K/count^2$	
Scan Motor Temperature Conv Coefficient 3	925	928	i	4	1	6	$K/count^3$	
Scan Motor Current Conversion Coefficient 0	929	932	i	4	1	6	A	
Scan Motor Current Conversion Coefficient 1	933	936	i	4	1	6	A/count	
Scan Motor Current Conversion Coefficient 2	937	940	i	4	1	6	$A/count^2$	
Scan Motor Current Conversion Coefficient 3	941	944	i	4	1	6	$A/count^3$	
Ch 16 LO Temperature Conversion Coefficient 0	945	948	i	4	1	6	K	
Ch 16 LO Temperature Conversion Coefficient 1	949	952	i	4	1	6	K/count	
Ch 16 LO Temperature Conversion Coefficient 2	953	956	i	4	1	6	$K/count^2$	
Ch 16 LO Temperature Conversion Coefficient 3	957	960	i	4	1	6	$K/count^3$	
Ch 17 LO Temperature Conversion Coefficient 0	961	964	i	4	1	6	K	
Ch 17 LO Temperature Conversion Coefficient 1	965	968	i	4	1	6	K/count	
Ch 17 LO Temperature Conversion Coefficient 2	969	972	i	4	1	6	$K/count^2$	
Ch 17 LO Temperature Conversion Coefficient 3	973	976	i	4	1	6	$K/count^3$	
Ch 18/19/20 LO Temp Conversion Coefficient 0	977	980	i	4	1	6	K	
Ch 18/19/20 LO Temp Conversion Coefficient 1	981	984	i	4	1	6	K/count	
Ch 18/19/20 LO Temp Conversion Coefficient 2	985	988	i	4	1	6	$K/count^2$	
Ch 18/19/20 LO Temp Conversion Coefficient 3	989	992	i	4	1	6	$K/count^3$	
<Zero Fill>	993	1000	i	4	2	0		
BIAS CORRECTION								
Bias Correction Values *(ordered by channel, field of view (FOV), and transmitter)* Word 1: Channel 16, FOV 1, STX-1 Word 2: Channel 17, FOV 1, STX-1 Word 3: Channel 18, FOV 1, STX-1 Word 4: Channel 19, FOV 1, STX-1 Word 5: Channel 20, FOV 1, STX-1 Word 6: Channel 16, FOV 5, STX-1 ... (channel values for FOVs 5, 10, 15, ... , 90) ... Word 95: Channel 20, FOV 90, STX-1 Word 96: Channel 16, space view, STX-1 ... Word 100: Channel 20, space view, STX-1 Word 101: Channel 16, warm view, STX-1 ... Word 106: Channel 16, FOV 1, STX-2 ... Word 211: Channel 16, FOV 1, STX-3 ... Word 316: Channel 16, FOV 1, SARR ... Word 420: Channel 20, warm view, SARR	1001	1840	i	2	420	0	counts	
<Zero Fill>	1841	1848	i	4	2	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
TRANSMITTER								
Transmitter Reference Power *(Mean power at the time bias corrections were derived. Range: 0 to 255, representing analog voltages from 0 to 5.1.)* Word 1: STX-1 Word 2: STX-2 Word 3: STX-3 Word 4: SARR	1849	1856	i	2	4	1	counts	
<Zero Fill>	1857	1864	i	4	2	0		
"NEW" BIAS CORRECTION								
"New" Bias Correction Values *(ordered by channel, field of view (FOV), and cycle within 8 second period)* Word 1: Channel 16, FOV 1, cycle 1 Word 2: Channel 17, FOV 1, cycle 1 Word 3: Channel 18, FOV 1, cycle 1 Word 4: Channel 19, FOV 1, cycle 1 Word 5: Channel 20, FOV 1, cycle 1 Word 6: Channel 16, FOV 3, cycle 1 ... (channel correction values for FOVs 3, 6, 9, ... , 90) ... Word 155: Channel 20, FOV 90, cycle 1 Word 156: Channel 16, space view, cycle 1 ... Word 160: Channel 20, space view, cycle 1 Word 161: Channel 16, warm view, cycle 1 ... Word 165: Channel 20, warm view, cycle 1 Word 166: Channel 16, FOV 1, cycle 2 ... Word 330: Channel 20, warm view, cycle 2 Word 331: Channel 16, FOV 1, cycle 3 ... Word 495: Channel 20, warm view, cycle 3	1865	2854	i	2	495	0	counts	
LUNAR CONTAMINATION								
Count of Scans Containing Lunar-Contaminated Space Views *(Also, see bits 7 and 6 of "Scan Line Quality Flags [Additional Calibration Problem Code]" field in data record.)* -1=the detection algorithm for lunar contamination is turned off 0=the detection algorithm is turned on: no scans containing lunar-contaminated space views were found >0=the detection algorithm is turned on: the value in this field represents the number of scans found that contain lunar-contaminated space views	2855	2856	i	2	1	0		
Lunar Angle Threshold *(Any space view whose lunar angle--see "Lunar Angles" field in data record--is less than this value is flagged as being "lunar contaminated" and is not used in the calibration.)*	2857	2858	u	2	1	2	degrees	
FILLER								
<Zero Fill>	2859	3072	i	2	107	0		

4.2 AMSU-B 1b Data Record Format

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
SCAN LINE INFORMATION								
Scan Line Number *(cumulative, starting with 1)*	1	2	u	2	1	0		
Scan Line Year *(four digits, e.g., 2000)*	3	4	u	2	1	0		
Scan Line Day of Year *(e.g., 365)*	5	6	u	2	1	0		
Satellite Clock Drift Delta	7	8	i	2	1	0	milliseconds	
Scan Line UTC Time of Day	9	12	u	4	1	0	milliseconds	
Scan Line Bit Field bit 15: satellite direction (0=northbound; 1=southbound) bit 14: clock drift correction (0=not corrected; 1=scan time corrected for clock drift) bits 13-0: <zero fill>	13	14	u	2	1	0		
Major Frame Count *(cumulative, starting with 1)*	15	16	u	2	1	0		
<Zero Fill>	17	24	i	4	2	0		
QUALITY INDICATORS								
Quality Indicator Bit Field *(if a bit is on (=1), the statement is true)* bit 31: do not use scan for product generation bit 30: time sequence error detected within this scan (see below) bit 29: data gap precedes this scan bit 28: insufficient data for calibration (see below) bit 27: earth location data not available (see below) bit 26: first good time following a clock update (nominally 0) bit 25: instrument status changed with this scan bits 24 - 7: <zero fill> bit 6: "new" bias status change (0=no status change detected in preceding or following scan; 1="new" bias calibration uncertain) bit 5: "new" bias status (1="new" bias correction on) bit 4: transmitter status change occurred bit 3: AMSU sync error detected bit 2: AMSU minor frame error detected bit 1: AMSU major frame error detected bit 0: AMSU parity error detected	25	28	u	4	1	0		
Scan Line Quality Flags [Additional Calibration Problem Code] *(If a bit is on (=1), the statement is true. See "Scan Line Quality Flags [Calibration Problem Code]", below.)* bit 7: scan line contains one or more space views that are lunar contaminated bit 6: lunar-contaminated scan line was able to be calibrated (only applicable if the previous flag [bit 7] is 1; otherwise, zero) bits 5-0: <zero fill>	29	29	u	1	1	0		
Scan Line Quality Flags [Time Problem Code] *(If a bit is on (=1), the statement is true. All bits off implies the scan time is as expected.)* bit 7: time field is bad but can probably be inferred from the previous good time bit 6: time field is bad and can't be inferred from the previous good time bit 5: this record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity). This may be associated with a spacecraft clock update. (See bit 26, Quality Indicator Bit Field.) bit 4: start of a sequence that apparently repeats scan times that have been previously accepted bits 3-0: <zero fill>	30	30	u	1	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Scan Line Quality Flags [Calibration Problem Code] *(If a bit is on (=1), the statement is true. These bits, along with those in "Scan Line Quality Flags [Additional Calibration Problem Code]", complement the channel indicators; all bits set to 0 indicates normal calibration.)* bit 7: scan line was not calibrated because of bad time bit 6: scan line was calibrated using fewer than the preferred number of scan lines because of proximity to start or end of data set or to a data gap bit 5: scan line was not calibrated because of bad or insufficient PRT data bit 4: scan line was calibrated but with marginal PRT data bit 3: some uncalibrated channels on this scan (see channel indicators) bit 2: uncalibrated due to instrument mode bit 1: questionable calibration because of antenna position error of space view bit 0: questionable calibration because of antenna position error of blackbody view	31	31	u	1	1	0		
Scan Line Quality Flags [Earth Location Problem Code] *(If a bit is on (=1), the statement is true. All bits set to 0 implies the earth location was normal.)* bit 7: not earth located because of bad time; earth location fields zero-filled bit 6: earth location questionable: questionable time code (see time problem flags above) bit 5: earth location questionable: marginal agreement with reasonableness check bit 4: earth location questionable: fails reasonableness check bit 3: earth location questionable because of antenna position check bits 2-0: <zero fill>	32	32	u	1	1	0		
Calibration Quality Flags *(all bits off implies a good calibration)* *Word 1: Channel 16* bits 15-6: <zero fill> bit 5: all bad blackbody counts for scan line bit 4: all bad space view counts for scan line bit 3: all bad PRTs for this line bit 2: marginal blackbody view counts for this line bit 1: marginal space view counts for this line bit 0: marginal PRT temps on this line *Words 2-5: Channels 17-20 (in order)*	33	42	u	2	5	0		
<Zero Fill>	43	60	i	2	9	0		
CALIBRATION COEFFICIENTS								
Note: The following coefficients are only available in Scan Normal and Investigation modes, otherwise the coefficient fields are <Zero Fill>. Refer to Digital A Housekeeping Telemetry, Digital Data Word A02 for the current mode.								
Primary Calibration Ch 16 Second Order Term, a2	61	64	i	4	1	16		
Primary Calibration Ch 16 First Order Term, a1	65	68	i	4	1	10		
Primary Calibration Ch 16 Zeroth Order Term, a0	69	72	i	4	1	6		
Primary Calibration Ch 17 Second Order Term, a2	73	76	i	4	1	16		
Primary Calibration Ch 17 First Order Term, a1	77	80	i	4	1	10		
Primary Calibration Ch 17 Zeroth Order Term, a0	81	84	i	4	1	6		
Primary Calibration Ch 18 Second Order Term, a2	85	88	i	4	1	16		
Primary Calibration Ch 18 First Order Term, a1	89	92	i	4	1	10		
Primary Calibration Ch 18 Zeroth Order Term, a0	93	96	i	4	1	6		
Primary Calibration Ch 19 Second Order Term, a2	97	100	i	4	1	16		
Primary Calibration Ch 19 First Order Term, a1	101	104	i	4	1	10		
Primary Calibration Ch 19 Zeroth Order Term, a0	105	108	i	4	1	6		
Primary Calibration Ch 20 Second Order Term, a2	109	112	i	4	1	16		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Primary Calibration Ch 20 First Order Term, a1	113	116	i	4	1	10		
Primary Calibration Ch 20 Zeroth Order Term, a0	117	120	i	4	1	6		
Secondary Calibration Ch 16 Second Order Term, a2	121	124	i	4	1	16		
Secondary Calibration Ch 16 First Order Term, a1	125	128	i	4	1	10		
Secondary Calibration Ch 16 Zeroth Order Term, a0	129	132	i	4	1	6		
Secondary Calibration Ch 17 Second Order Term, a2	133	136	i	4	1	16		
Secondary Calibration Ch 17 First Order Term, a1	137	140	i	4	1	10		
Secondary Calibration Ch 17 Zeroth Order Term, a0	141	144	i	4	1	6		
Secondary Calibration Ch 18 Second Order Term, a2	145	148	i	4	1	16		
Secondary Calibration Ch 18 First Order Term, a1	149	152	i	4	1	10		
Secondary Calibration Ch 18 Zeroth Order Term, a0	153	156	i	4	1	6		
Secondary Calibration Ch 19 Second Order Term, a2	157	160	i	4	1	16		
Secondary Calibration Ch 19 First Order Term, a1	161	164	i	4	1	10		
Secondary Calibration Ch 19 Zeroth Order Term, a0	165	168	i	4	1	6		
Secondary Calibration Ch 20 Second Order Term, a2	169	172	i	4	1	16		
Secondary Calibration Ch 20 First Order Term, a1	173	176	i	4	1	10		
Secondary Calibration Ch 20 Zeroth Order Term, a0	177	180	i	4	1	6		
<Zero Fill>	181	190	i	2	5	0		
NAVIGATION								
Total Applied Attitude Correction Word 1: Roll Word 2: Pitch Word 3: Yaw	191	196	i	2	3	3	degrees	
Navigation Status Bit Field bits 31-18: <zero fill> bit 17: earth location at the satellite subpoint is accurate and reasonable, i.e., is within tolerance defined by "Nadir Earth Location Tolerance" in header (0=out of tolerance; 1=in tolerance) bit 16: earth location corrected for Euler angles (0=FALSE; 1=TRUE) bits 15-12: earth location indicator (0=earth location available; 1=user ephemeris files greater than 24 hours old; 2=no earth location available) bits 11-8: spacecraft attitude control (0=operating in YGC or NOMINAL mode; 1=operating in another mode; 2=attitude exceeds nominal tolerance; 3=both 1 and 2) bits 7-4: attitude SMODE (0=nominal mode; 1=rate nulling mode; 2=YGC mode; 3=search mode; 4=coast mode) bits 3-0: attitude PWTIP$AC (0=nominal mode/no test; 1=yaw axis test in progress; 2=roll axis test in progress; 3=pitch axis test in progress)	197	200	u	4	1	0		
Time Associated with Euler Angles	201	204	i	4	1	0	seconds	
Euler Angles Word 1: Roll Word 2: Pitch Word 3: Yaw	205	210	i	2	3	3	degrees	
Spacecraft Altitude above Reference Ellipsoid	211	212	u	2	1	1	kilometers	
Angular Relationships *(relative azimuth range +/- 180.00 degrees)* Word 1: Solar zenith angle, FOV 1 Word 2: Satellite zenith angle, FOV 1 Word 3: Relative azimuth angle, FOV 1 Word 4: Solar zenith angle, FOV 2 ... (set of 3 angles every FOV) ... Word 270: Relative azimuth angle, FOV 90	213	752	i	2	270	2	degrees	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Earth Location *(north latitude and east longitude are positive)* Word 1: Latitude, FOV 1 Word 2: Longitude, FOV 1 Word 3: Latitude, FOV 2 ... (lat/lon word pair every FOV) ... Word 180: Longitude, FOV 90	753	1472	i	4	180	4	degrees	
Lunar Angles *(angles between moon and individual space views; range 0 to 180.00 degrees)* Word 1: Angle between moon and space view 1 Word 2: Angle between moon and space view 2 Word 3: Angle between moon and space view 3 Word 4: Angle between moon and space view 4	1473	1480	u	2	4	2	degrees	
AMSU-B SENSOR DATA								
Scene Data Word 1: Shaft position for FOV 1 Words 2-6: Scene counts for FOV 1, channels 16-20 (in order) Word 7: Shaft position for FOV 2 Words 8-12: Scene counts for FOV 2, channels 16-20 (in order) ... (6 words for every FOV) ... Word 535: Shaft position for FOV 90 Words 536-540: Scene counts for FOV 90, channels 16-20 (in order)	1481	2560	u	2	540	0	counts	
<Zero Fill>	2561	2568	i	4	2	0		
CALIBRATION DATA								
Space View Data Word 1: Shaft position for space view 1 Word 2-6: Scene counts for space view 1, channel 16-20 (in order) Word 7: Shaft position for space view 2 Word 8-12: Scene counts for space view 2, channel 16-20 (in order) Word 13: Shaft position for space view 3 Word 14-18: Scene counts for space view 3, channel 16-20 (in order) Word 19: Shaft position for space view 4 Word 20-24: Scene counts for space view 4, channel 16-20 (in order)	2569	2616	u	2	24	0	counts	
Target View Data Word 1: Shaft position for target view 1 Word 2-6: Scene counts for target view 1, channel 16-20 (in order) Word 7: Shaft position for target view 2 Word 8-12: Scene counts for target view 2, channel 16-20 (in order) Word 13: Shaft position for target view 3 Word 14-18: Scene counts for target view 3, channel 16-20 (in order) Word 19: Shaft position for target view 4 Word 20-24: Scene counts for target view 4, channel 16-20 (in order)	2617	2664	u	2	24	0	counts	
<Zero Fill>	2665	2672	i	4	2	0		
DIGITAL A HOUSEKEEPING TELEMETRY								
Invalid Data Bit Flags *(If bit = 1, associated telemetry words are not valid, i.e., they are zero-filled, possibly due to lost frames.)* bits 31-1: <zero fill> bit 0: digital data words A01 and A02	2673	2676	u	4	1	0		
<Reserved> *(value undefined)*	2677	2680	i	4	1	0		

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
Digital Data Word A01 *(unit ID and flags)* bits 15-13: <not defined> bit 12: processor check flag (0=built-in-test passed; 1=built-in-test failed) bit 11: scan control status (0=running; 1=aborted) bit 10: pixel data invalid flag (0=valid; 1=invalid) bit 9: scan synchronization (0=error < 0.1 deg. at 8 sec. sync pulse; 1=error >= 0.1 deg. at 8 sec. sync pulse) bit 8: mode transition flag (0=transition complete; 1=transition in progress) bit 7: module ID (msb) bits 6-1: module ID bit 0: module ID (lsb)	2681	2682	u	2	1	0		
Digital Data Word A02 *(digital B telemetry)* bit 15: RAM check flag (0=passed; 1=failed) bit 14: ROM check flag (0=passed; 1=failed) bit 13: memory checks status (0=disabled; 1=enabled) bit 12: space view select (lsb) bit 11: space view select (msb) bit 10: channel 18/19/20 (relay 5 status) (0=off; 1=on) bit 9: channel 17 (relay 4 status) (0=off; 1=on) bit 8: channel 16 (relay 4 status) (0=off; 1=on) bit 7: stepped mode (0=no; 1=yes) bit 6: investigation mode (0=no; 1=yes) bit 5: parked in space view mode (0=no; 1=yes) bit 4: parked in nadir view mode (0=no; 1=yes) bit 3: parked in target view mode (0=no; 1=yes) bit 2: scan normal mode (0=no; 1=yes) bit 1: survival heater (relay 2 status) (0=off; 1=on) bit 0: power (relay 1 status) (0=off; 1=on)	2683	2684	u	2	1	0		
Mixer 16 Temperature	2685	2686	i	2	1	0	counts	
Mixer 17 Temperature	2687	2688	i	2	1	0	counts	
Mixer 18, 19, and 20 Temperature	2689	2690	i	2	1	0	counts	
FET Amplifier 16 Temperature	2691	2692	i	2	1	0	counts	
FET Amplifier 17 Temperature	2693	2694	i	2	1	0	counts	
FET Amplifier 18 Temperature	2695	2696	i	2	1	0	counts	
FET Amplifier 19 Temperature	2697	2698	i	2	1	0	counts	
FET Amplifier 20 Temperature	2699	2700	i	2	1	0	counts	
Calibration Target Temperature 1	2701	2702	i	2	1	0	counts	
Calibration Target Temperature 2	2703	2704	i	2	1	0	counts	
Calibration Target Temperature 3	2705	2706	i	2	1	0	counts	
Calibration Target Temperature 4	2707	2708	i	2	1	0	counts	
Calibration Target Temperature 5	2709	2710	i	2	1	0	counts	
Calibration Target Temperature 6	2711	2712	i	2	1	0	counts	
Calibration Target Temperature 7	2713	2714	i	2	1	0	counts	
Sub-reflector Temperature 1	2715	2716	i	2	1	0	counts	
Local Oscillator Monitor Current 16	2717	2718	i	2	1	0	counts	
Local Oscillator Monitor Current 17	2719	2720	i	2	1	0	counts	
Local Oscillator Monitor Current 18, 19, and 20	2721	2722	i	2	1	0	counts	
Local Oscillator 16 Temperature	2723	2724	i	2	1	0	counts	
Local Oscillator 17 Temperature	2725	2726	i	2	1	0	counts	
Local Oscillator 18, 19, and 20 Temperature	2727	2728	i	2	1	0	counts	
PRT Bridge Voltage	2729	2730	i	2	1	0	counts	
PRT Board Temperature	2731	2732	i	2	1	0	counts	
<Zero Fill>	2733	2744	i	4	3	0	counts	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
ANALOG HOUSEKEEPING TELEMETRY								
Analog Telemetry Update Flags *(If bit = 1, associated telemetry item was not updated during most recent minor frame cycle - possibly due to lost frame.)* bits 31-28: <zero fill> bit 27: SARR-B power bit 26: SARR-A power bit 25: STX-3 power bit 24: STX-2 power bit 23: STX-1 power bit 22: STX-4 status bit 21: STX-3 status bit 20: STX-2 status bit 19: STX-1 status bit 18: ch 18/19/20 LO temperature bit 17: ch 17 LO temperature bit 16: ch 16 LO temperature bit 15: scan motor current bit 14: scan motor temperature bit 13: PSU temperature bit 12: PEU temperature bit 11: MDE temperature bit 10: ICE temperature bit 9: +5V reference secondary bit 8: -5V (A) secondary bit 7: +5V (A) secondary bit 6: +5V (D) secondary bit 5: +8V (A) secondary bit 4: -15V (A) secondary bit 3: +15V (A) secondary bit 2: -12V (A) secondary bit 1: +12V (A) secondary bit 0: <zero fill>	2745	2748	u	4	1	0		
+12V (A) Secondary	2749	2750	i	2	1	0	counts	
-12V (A) Secondary	2751	2752	i	2	1	0	counts	
+15V (A) Secondary	2753	2754	i	2	1	0	counts	
-15V (A) Secondary	2755	2756	i	2	1	0	counts	
+8V (A) Secondary	2757	2758	i	2	1	0	counts	
+5V (D) Secondary	2759	2760	i	2	1	0	counts	
+5V (A) Secondary	2761	2762	i	2	1	0	counts	
-5V (A) Secondary	2763	2764	i	2	1	0	counts	
+5V Reference Secondary	2765	2766	i	2	1	0	counts	
ICE Temperature	2767	2768	i	2	1	0	counts	
MDE Temperature	2769	2770	i	2	1	0	counts	
PEU Temperature	2771	2772	i	2	1	0	counts	
PSU Temperature	2773	2774	i	2	1	0	counts	
Scan Motor Temperature	2775	2776	i	2	1	0	counts	
Scan Motor Current	2777	2778	i	2	1	0	counts	
Ch 16 LO Temperature	2779	2780	i	2	1	0	counts	
Ch 17 LO Temperature	2781	2782	i	2	1	0	counts	
Ch 18/19/20 LO Temperature	2783	2784	i	2	1	0	counts	
STX-1 Status	2785	2786	i	2	1	0	counts	
STX-2 Status	2787	2788	i	2	1	0	counts	
STX-3 Status	2789	2790	i	2	1	0	counts	
STX-4 Status	2791	2792	i	2	1	0	counts	
STX-1 Power	2793	2794	i	2	1	0	counts	
STX-2 Power	2795	2796	i	2	1	0	counts	
STX-3 Power	2797	2798	i	2	1	0	counts	
SARR-A Power 2	2799	2800	i	2	1	0	counts	
SARR-B Power 2	2801	2802	i	2	1	0	counts	

Field Name	Start Octet	End Octet	Data Type	Word Size	Number of Words	Scale Factor	Units	Notes
<Zero Fill>	2803	2804	i	2	1	0		
FILLER								
<Zero Fill>	2805	3072	i	4	67	0		

5 TBCs/TBDs

TBD1: The content and format of the secondary header record.

6 Notes

7 Acronyms

A	Amperes (Amps)
AD	Applicable Document
AIP	AMSU Instrument Processor
AMSU	Advanced Microwave Sounding Unit
ASCII	American Standard Code for Information Interchange
AU	Astronomical Unit
cm	centimeter
CPIDS	Calibration Parameters Input Data Set
FET	Field-Effect Transistor
FM	Flight Model
FOV	Field Of View
GAC	Global Area Coverage
HRPT	High Resolution Picture Transmission
ICE	Inductosyn Control Electronics
IJPS	Initial Joint Polar-orbiting Operational Satellite System
K	Kelvin
km	kilometer
LAC	Local Area Coverage
LO	Local Oscillator
lsb	least significant bit
m	(1) meter; (2) milli-
MDE	Motor Drive Electronics
msb	most significant bit
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
PACS	Polar Acquisition and Control Subsystem
PEU	Processing Electronics Unit
PSU	Power Supply Unit
PRT	Platinum Resistance Thermometer
RAM	Random-Access Memory
ROM	Read-Only Memory
SARR	Search and Rescue Repeater
SOCC	Satellite Operations Control Center
sr	steradian
STX	S-band Transmitter
TBC	To Be Confirmed
TBD	To Be Determined
TIP	TIROS Information Processor
TIROS	Television Infrared Observation Satellite

UTC	Universal Time Coordinated
V	Volts
W	Watts
YGC	Yaw Gyrocompassing